NON-PUBLIC?: N
ACCESSION #: 9104230268
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Davis-Besse Unit No. 1 PAGE: 1 OF 05

DOCKET NUMBER: 05000346

TITLE: Reactor Trip Due to Group Rod Drop
EVENT DATE: 12/13/90 LER #: 90-016-01 REPORT DATE: 04/ /91

OTHER FACILITIES INVOLVED: DOCKET NO: 05000

OPERATING MODE: 1 POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR SECTION:
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:
NAME: R. W. Gaston, Nuclear Licensing TELEPHONE: (419) 321-7377
Technologist

COMPONENT FAILURE DESCRIPTION:
CAUSE: X SYSTEM: AA COMPONENT: RLY MANUFACTURER: P297
REPORTABLE NPRDS: N

SUPPLEMENTAL REPORT EXPECTED: No

ABSTRACT:

On December 13, 1990 at 0844 hours, the plant experienced a Reactor Coolant System (RCS) low pressure trip. A functional test of the Reactor Protection System (RPS) Channel 1 Reactor Trip Module Logic and Reactor Trip Breaker B was in progress when the trip occurred. Reactor Trip Breaker B had been previously tripped as part of the RPS functional test. Seven of eight control rods in Rod Group 7 dropped into the core causing reactor power to initially decrease to approximately 48 percent. RCS pressure and temperature decreased due to a resulting mismatch between reactor power and feedwater flow. RPS subsequently tripped the reactor on low RCS pressure. The cause of the Group 7 rod drop was determined to be a failed contact in a motor return Silicon Controlled Rectifier (SCR) gating signal blocking relay for the "A" side power train of the Control Rod Drive (CRD) System. Plant response to the reactor trip was normal with key parameters remaining in the normal post-trip band.

Immediate notification was made per 10CFR50.72(b)(2)(ii) on December 13, 1990, at 0944 hours. The reactor trip is being reported pursuant to the requirements of 10CFR50.73(a)(2)(iv).

END OF ABSTRACT

Description of Occurrence:

On December 13, 1990
at 0844 hours, the plant experienced a Reactor
Coolant System (RCS) low pressure trip. Surveillance Test DB-MI-03011, Channel Functional Test of RPS (RPS-JC) Channel 1 Reactor Trip Module Logic and Reactor Trip Breaker B was in progress prior to the trip. Reactor Trip Breaker B had been previously tripped as part of the surveillance test.

Approximately 15 seconds prior to the reactor trip seven of eight control rods in regulating Rod Group 7 dropped into the core causing reactor power to decrease to approximately 48 percent. RCS pressure and temperature decreased due to resulting mismatch between reactor power and feedwater flow. RPS subsequently tripped the reactor on low RCS pressure.

Plant response to the reactor trip was normal with key parameters remaining in the normal post-trip band. The rod which did not initially drop with the Group 7 rods inserted when the reactor trip signal was received. The apparent cause for the group rod drop and the subsequent reactor trip are described below.

The reactor trip (RPS actuation) is reportable in accordance with 10CFR50.73(a)(2)(iv). Immediate notification to the NRC was made via the Emergency Notification System (ENS) at 0944 hours on December 13, 1990 per 10CFR50.72(b)(2)(ii).

The plant was restarted on December 15, 1990 and returned to full power operation on December 16, 1990.

Apparent Cause of Occurrence:

The plant trip was caused by a low RCS pressure input to RPS. The RCS low pressure condition resulted from a reactor power to feedwater flow mismatch which occurred when the Group 7 control rods dropped into the reactor.

The cause of the group rod drop was attributed to a failed contact in the Control Rod Drive (CRD-AA) Electronic Trip "C" Motor Return SCR gating signal blocking relay (K11A). This failed contact blocked the gating signal to the A1 Motor Return Silicon Controlled Rectifier (SCR). With the gating signal removed, the power to the CRD stator coils which were energized from the CRD Motor Generator (MG) was reduced by a factor of approximately one third. The opening of CRD Trip Breaker "B" for testing placed reliance for CRD stator power on the CRD MG. In this configuration the power available to the control rods

Apparent Cause of Occurrence (Continued):

was sufficient to maintain them latched while stationary, but insufficient to permit rod motion. When ICS commanded Group 7 rods to move outward, seven of the eight control rods in the group dropped into the core. When the rods dropped, RCS pressure began to decrease and RPS initiated a plant trip on low RCS pressure.

Rod 7-1 did not fall upon receipt of the ICS out command due to having a stronger magnetic field than the other Group 7 rods. A high resistance in the current return path for the Rod 7-1 stator motor windings was identified prior to the plant trip. This high resistance caused a stronger magnetic field in the Rod 7-1 CRD motor. This is the likely cause of Rod 7-1 remaining in place when the rest of the rod group dropped on December 13, 1990. Control Rod 7-1 was properly inserted when the reactor trip signal was received.

Analysis of Occurrence:

The RPS properly responded to a valid RCS low pressure condition which resulted from the unanticipated insertion of Group 7 control rods. Plant response to the trip was normal with key parameters remaining in the normal post-trip band. The post-trip response is categorized as an "A" event per the Babcock and Wilcox Owner's Group (B&WOG) criteria.

The cause of the Group 7 rod drop was attributed to a random failure of a K11A relay contact in the gating circuit for a CRD motor return SCR. A review of maintenance history, previous LERs and NPRDS data revealed no additional failures of Model KHU17A11 Potter Bromfield relays.

Procedures which open CRD Trip Breakers or initiate Diverse Scram System (DSS) trips above Mode 3 are being revised to include a prerequisite step to verify that two phases are energized on the safety group power supplies prior to testing. This action will ensure that K11A relay

contacts are properly passing the associated Motor Return SCR gating signals.

Analysis of Occurrence (Continued):

Additional relays in the CRD system which are of the same model as the K11A relay will alarm the programmer lamp fault computer point (0186) if they fail in the same mode as the K11A relay.

Corrective Action:

Prior to restarting the plant on December 15, 1990, proper operation of all Group 7 CRD power supplies was established by:

- Performing cabinet wiring checks
- Verifying phase indication lights on power supply and individual transfer switches were lit in the proper sequence
- Monitoring each power supply phase feeding Group 7 rods and observing the proper waveforms
- Moving Group 7 rods with the CRD breakers B open and noting no abnormalities

In addition, a suspect CRD motor generator set voltage regulator card was replaced on December 27, 1990. Subsequent monitoring revealed this was not a likely cause of the group rod drop.

During the week of January 7, 1991, surveillance testing was successfully completed for RPS and Anticipatory Reactor Trip System (ARTS) channels 1 and 2 and Diverse Scram System (DSS) Channel 2.

Although no specific cause for the initiating event was identified during preliminary investigation, it was believed that the existence of a CRD system fault concurrent with rod motion resulted in the group rod drop and subsequent plant trip. Standing Order No. 90-061 (reissued as 91-030) was issued on December 14, 1990 to require the Reactor Demand Hand/Auto Station and Rod Control panel be placed in manual to inhibit rod motion during any surveillance testing which involved the opening of a CRD breaker.

After plant restart, Surveillance Test Procedures DB-MI-03011 through DB-MI-03014, Channel Functional Test of RPS Channels/Reactor Trip Module Logic and Reactor Trip Breakers were revised to include the requirements of Standing Order 91-030.

Corrective Action (Continued):

After identifying the failed relay problem, Standing Order 91-30 was canceled, reissued as 91-46, and revised to incorporate the following additional requirements. Prior to intentionally opening any CRD Trip Breaker or performance of testing that impacts CRD Trip Breakers or power supplies, Standing Order 91-46 requires that the CRD System be inspected to ensure that each Safety Rod Power Supply has only two phases energized and that each Regulating Rod Transfer Switch fuse has two phases energized. If an unexpected loss of a CRD Trip Breaker or Power Supply train occurs the Standing Order also requires that the Reactor Demand and Diamond Hand/Auto Stations be placed in manual as soon as practicable.

The defective 120VAC Potter and Brumfield electronic trip relay which initiated the rod drop event was successfully replaced on March 1, 1991. The corrective actions described above should preclude the recurrence of a similarly initiated reactor trip.

Failure Data:

The most recent reactor trip initiated from a CRD System malfunction occurred on January 18, 1989 and was reported in LER No. 89-03, dated February 16, 1989.

NP-33-90-20 PCAQ NO. 90-0755

TOLEDO
EDISON

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Log No.: AB-91-0004
NP 33-90-20, Revision 1

Docket No. 50-346

License No. NPF-3

April 11, 1991

United States Nuclear Regulatory Commission
Document Control Desk
Washington, D. C. 20555

Gentlemen:

LER 90-016, Revision 1
Davis-Besse Nuclear Power Station, Unit No. 1
Date of Occurrence - December 13, 1990

Enclosed please find Revision 1 to Licensee Event Report 90-016 which includes the recently identified cause for the occurrence and provides additional corrective actions. The changes are marked with a revision bar in the left margin. Please destroy or mark superseded any previous copies of this LER.

Yours truly,

Louis F. Storz
Plant Manager
Davis-Besse Nuclear Power Station

LFS/eld

Enclosure

cc: Mr. A. Bert Davis
Regional Administrator
USNRC Region III

Mr. Paul Byron
DB-1 NRC Sr. Resident Inspector

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